A combined regionalized crustal and whole mantle model for the Mediterranean, North Africa, Middle East and Western Eurasia

István Bondár, Mike Antolik, Joydeep Bhattacharyya, Goran Ekström

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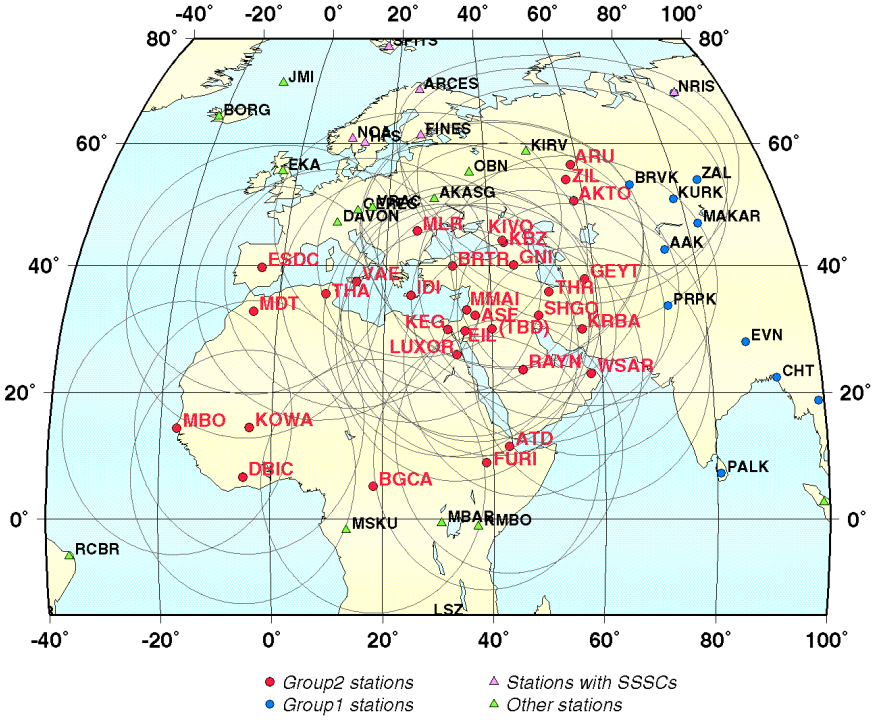
Overview



- Objectives
- Group2 Consortium
- Harvard mantle model
- SAIC regionalized crustal model
- Conclusions & Outlook

Objectives

- Improve locations based on the sparse IMS network, reduce location bias and uncertainties
- Develop 3D models (global/regional body/surface wave tomography, regionalized models)
- Calculate regional travel times (Pn, Sn, Pg, Lg) for selected stations in the region by ray-tracing through a 3D model
- Derive correction and modeling error surfaces centered on stations relative to IASPEI91 (SSSCs)
- Validate models using reference events: demonstrate that locations improve

Consortium: 3-year, 2-phase project

- Project started in April, 2000
- Task: deliver correction surfaces for IMS stations in the region
- Group2 members:
  - SAIC, CUB, Harvard, GII, Multimax, UCSD
- First delivery, June 2001:
  - models based on existing data and models, preliminary correction surfaces for surface sources, reference event list
- Final delivery, January 2003:
  - Final models, refined, depth-dependent correction surfaces, reference event list
- Web site: http://g2calibration.cmr.gov

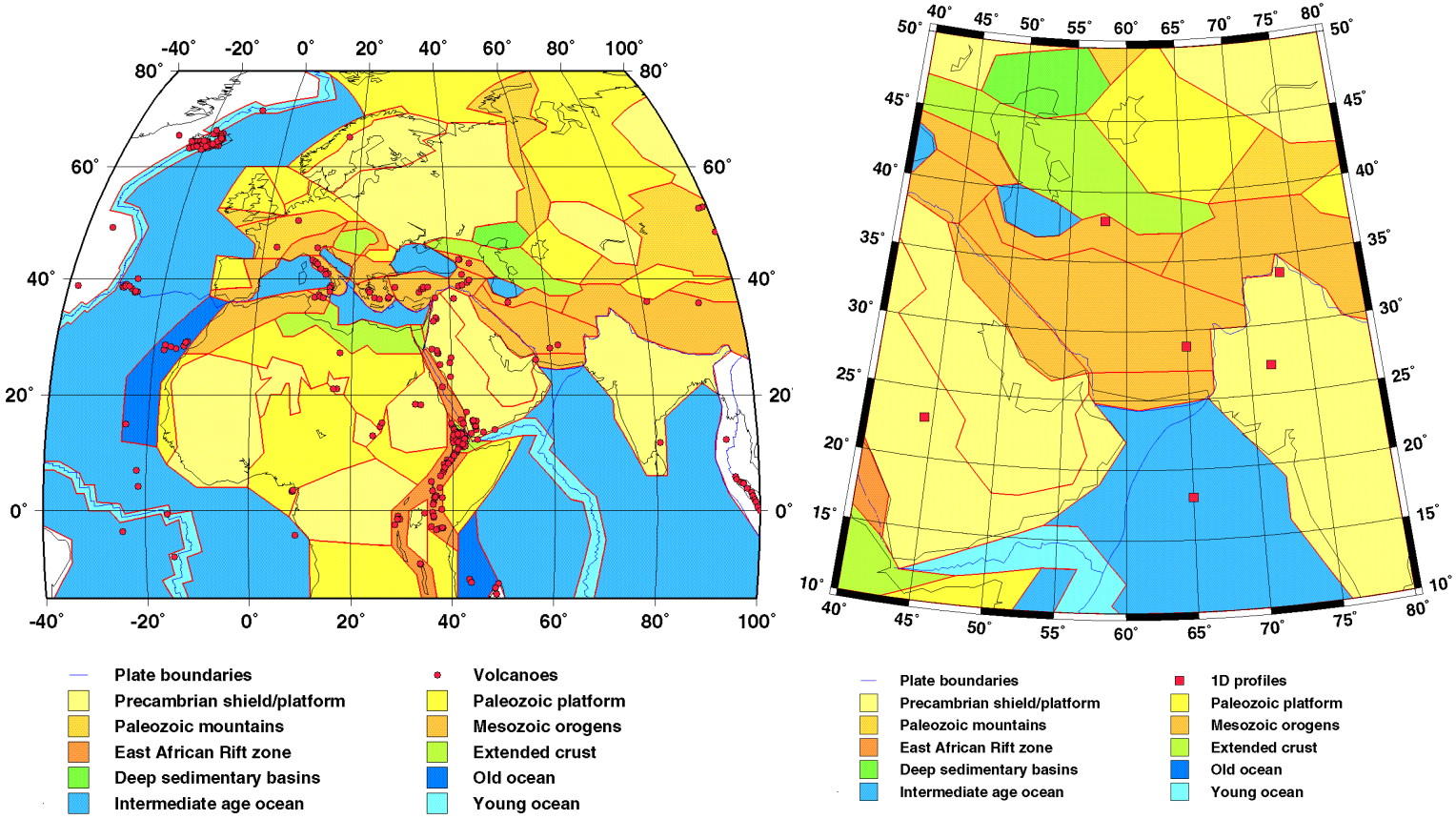
Harvard S&P362 whole mantle model

- Isotropic P and S model obtained from the joint inversion of body and surface wave data
  - 950,000 teleseismic P and S direct and differential travel times formed into summary rays
  - 60,000 Rayleigh and Love phase velocities (35-150s)
  - SP12 as starting model
- Parameterization: spherical and radial B-splines
- 1000-1500 km horizontal, 500-100 km vertical resolution
- No crust (model starts at 25km)
- http://g2calibration.cmr.gov/calibration/result.html#harvard

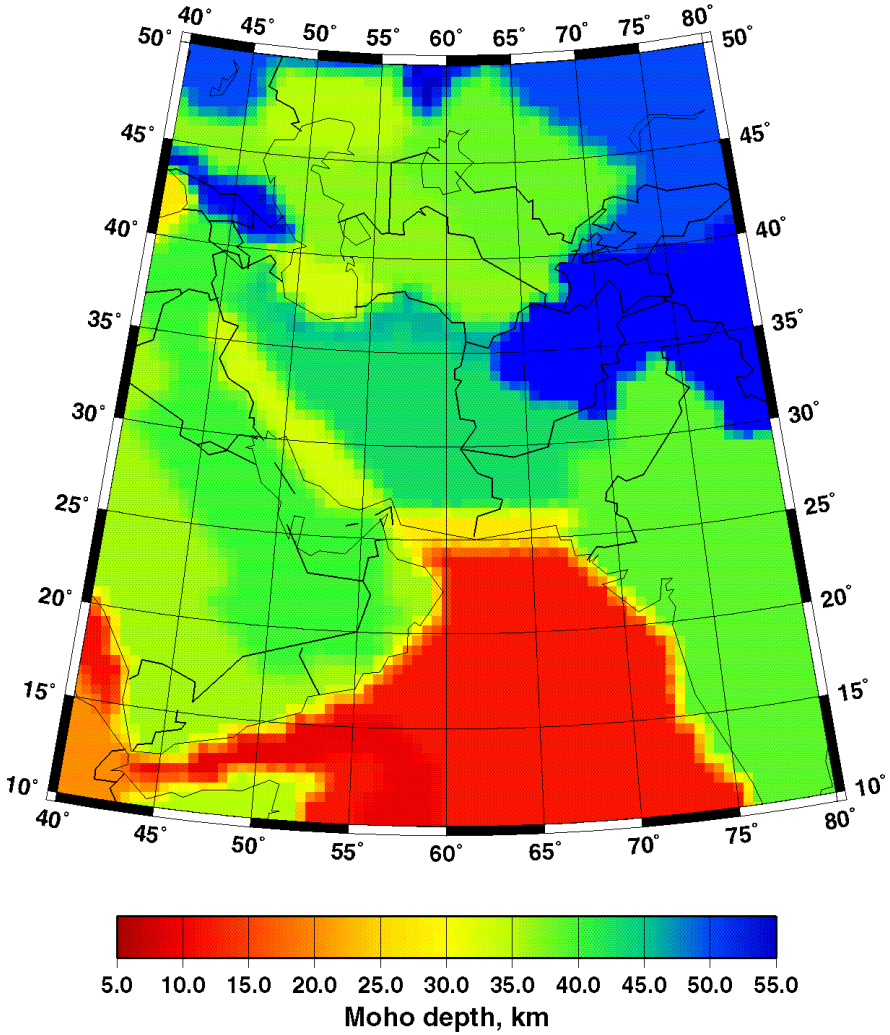
SAIC regionalized crustal model

- Based on published literature in major reviewed journals and existing regionalizations
- Preferred sources: refraction profiles, full waveform inversion, surface/body wave tomography, receiver function analysis
- Each region is described by a 1D velocity model (P and S velocities as well as density, QP, QS if available)
- Database schema has been developed to represent models
- http://g2calibration.cmr.gov/calibration/result.html#regmod

SAIC regionalized crustal model

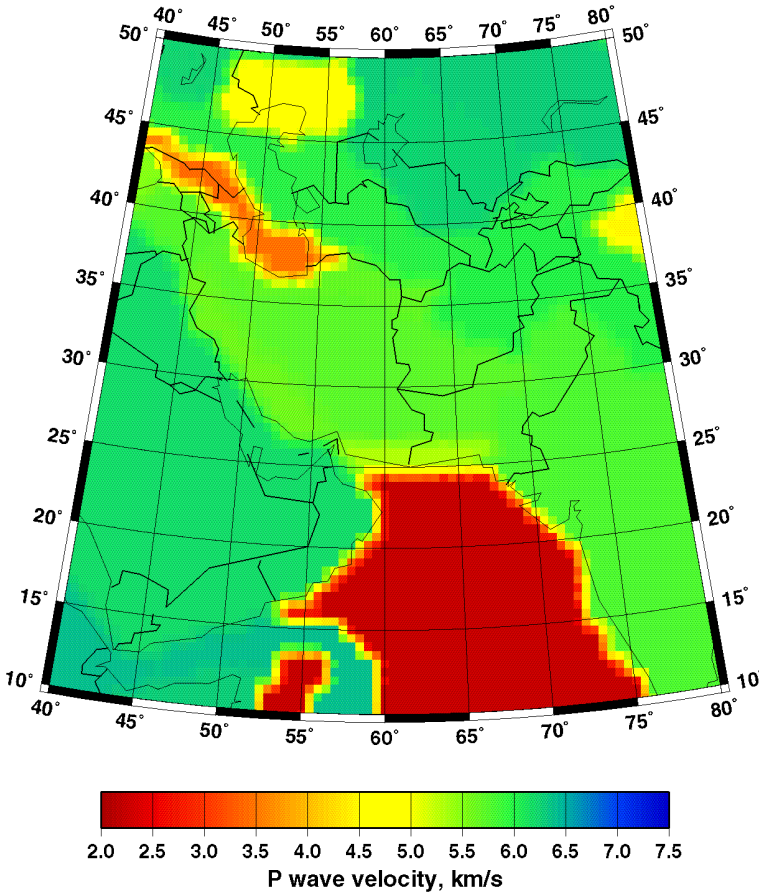


Moho depth

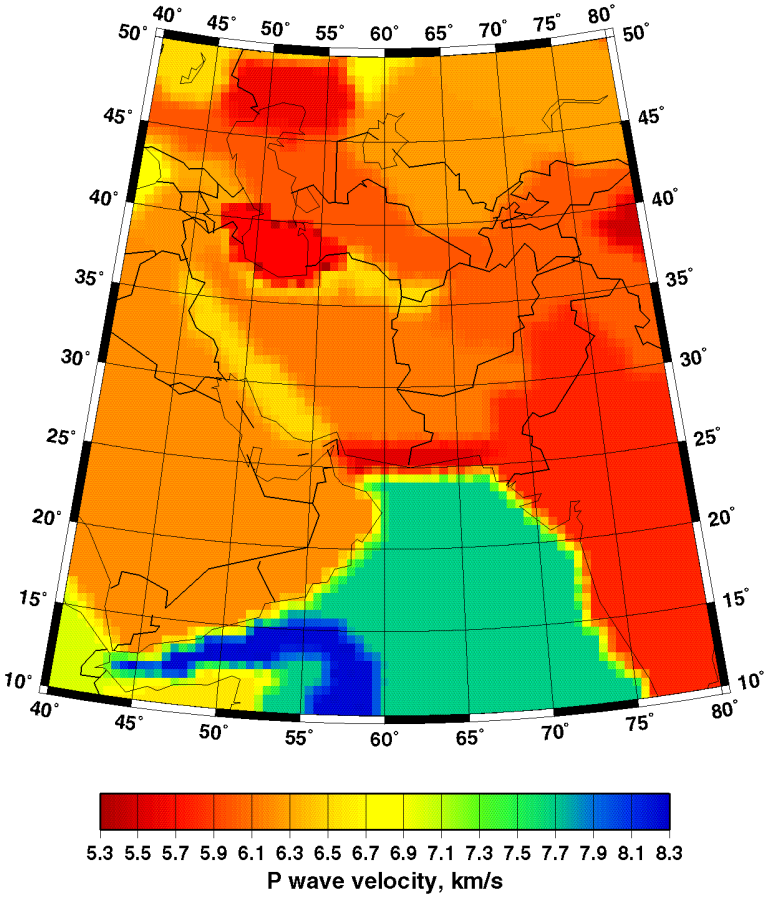

40° 45° 50° 55° 60° 65° 70° 75° 80°
50° 45° 40° 35° 30° 25° 20° 15° 10°
5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0 50.0 55.0
Moho depth, km

Depth slices

SAIC-Harvard P model, depth=5 km

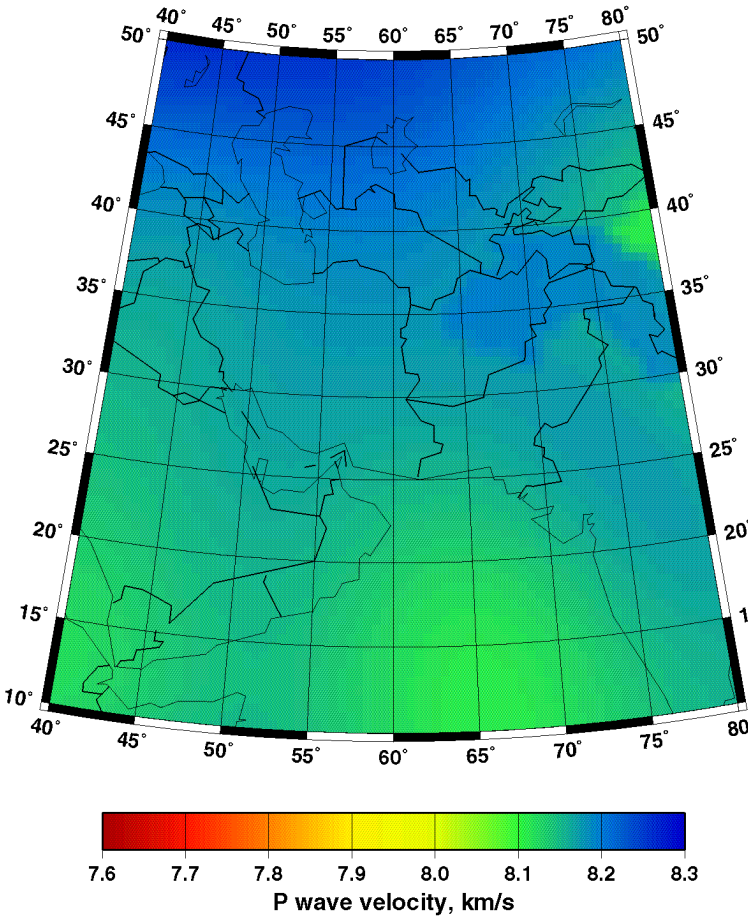


SAIC-Harvard P model, depth=15 km

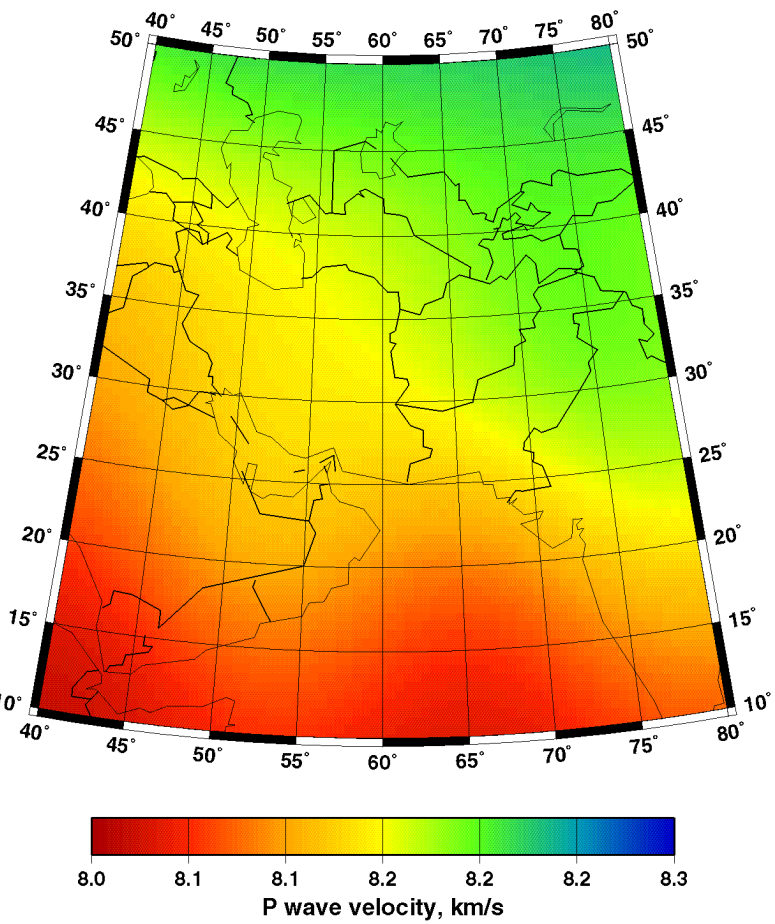


Depth slices

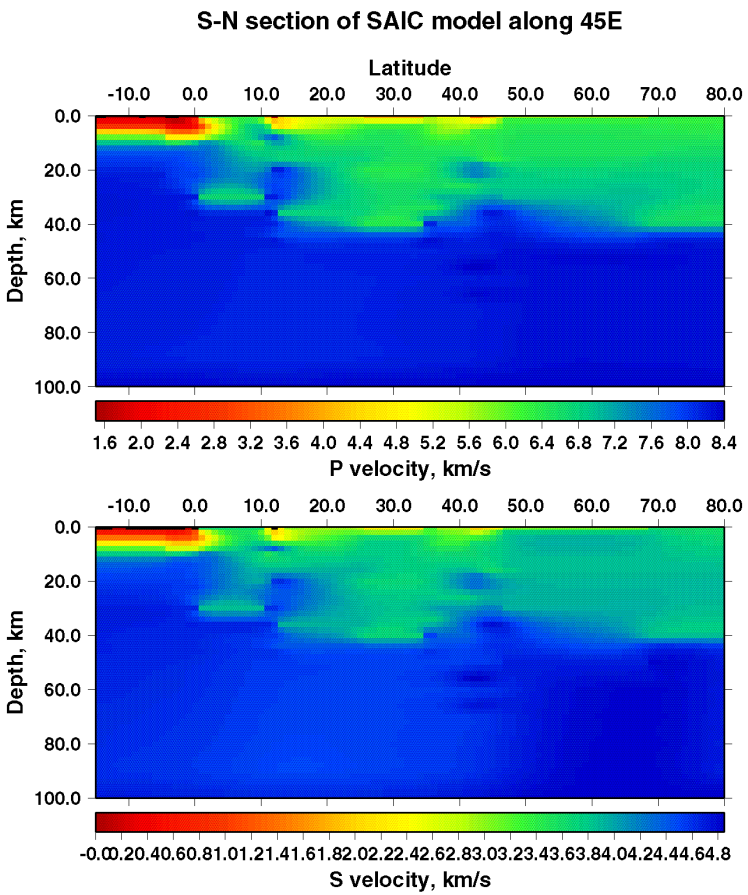
SAIC-Harvard P model, depth=75 km

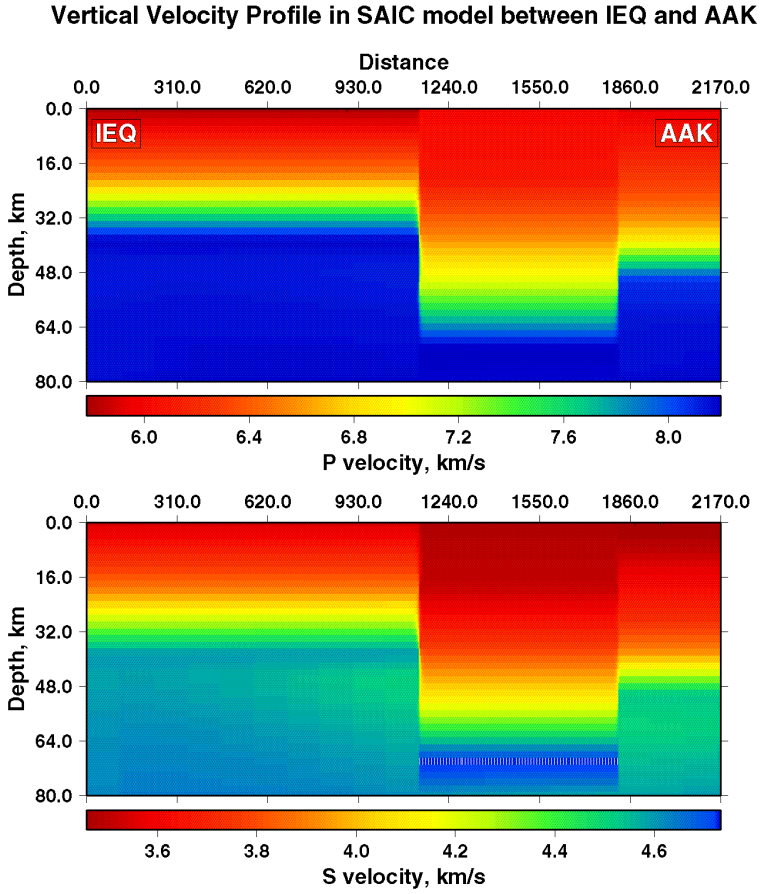


SAIC-Harvard P model, depth=200 km



Vertical cross-sections





Conclusions, Outlook

- A global, whole mantle P and S model has been developed at Harvard
- A regionalized crustal velocity model has been developed for the Group2 region of interest at SAIC
- The SAIC regionalized model was combined with the Harvard P&S362 mantle models
- Preparations for travel time computations via raytracing through the model are being done
- Correction surfaces relative to IASPEI (SSSCs) will be generated
- Reference events will be relocated to validate the model